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ENERGY AND ENVIRONMENT CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
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FRANKFORT KENTUCKY 40601
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April 19, 2012

Mr. Bobby Burgess, Chairman
P.O. Box 188
Crittenden, KY 41030

RE: Bullock Pen Water District
AI # 1476
Grant Co Improvement GPR

Dear Mr. Bobby Burgess:

Thank you for submitting a Green Project Reserve Business Case for the Grant County Drinking Water Improvement Project, funded through the DWSRF program. A provision of the 2012 DWSRF capitalization grant requires that to the extent there are eligible project applications; states shall use 20% of its Drinking Water State Revolving Fund capitalization grant for green infrastructure projects. These projects are intended to address water and energy efficiency improvements or other environmentally innovative activities. The Kentucky Division of Water (KY DOW) has reviewed the business case provided for the project. The new energy efficient pump was determined to be acceptable with a provided construction cost of \$120,000. If the scope of the project is altered in any way to exclude the GPR eligible component, Bullock Pen Water District shall submit the changes in writing to the KY DOW and receive prior approval in writing before proceeding with construction.

We look forward to working with you in finalizing your drinking water infrastructure project. If you have any questions regarding this correspondence, please contact me at (502) 564-3410, ext 4832.

Sincerely,

A handwritten signature in cursive script, reading "Greg Goode".

Greg Goode, P.E.
Water Infrastructure Branch
Division of Water

Cc: Patrick Darning, P.E., CMW

**Bullock Pen Water District
Grant County Improvement Project
DWL1133**

Green Project Reserve (GPR) – Energy Efficiency Business Case

Summary

- This project involves the construction of a new 500,000 gallon elevated storage tank, a new pump station, and 0.92 miles of new 8 inch water line replacing 3 & 4 inch water lines to serve the west side of I-75 through Crittenden & Grant County. The new tank, pump station, and water lines are to meet the Kentucky Division of Water requirements.
- New pump station is to include high efficiency pumps and motors with variable frequency drive controls.
- DWSRF Loan amount is \$1,663,000.
- New pump station cost is estimated at \$120,000.
- Estimated energy efficiency (green) portion of loan is 7.2%.

Calculated Energy Efficiency of New Pumps

- New pumps will have a rated efficiency of 83% minimum.
- New energy efficient motors will have a rated efficiency of 92% minimum. With the variable frequency drive controls, we expect the load factor to be approximately 96%. Therefore, the total efficiency of the new motors are $(92\%)(96\%) = 88\%$.
- Total efficiency (wire-to-water) of proposed new pumps & motors = $(83\%)(88\%) = 73\%$ (pump efficiency times total motor efficiency).

Calculated Energy Efficiency of Existing Pumps

- Existing pumps currently serving the project area have a rated efficiency of 73%.
- Existing motors currently serving the project area have an efficiency of approximately 90%. The existing 50 hp pump motors run most efficient at approximately 43 hp, so the load factor of the existing motors are approximately $(43/50)(100) = 86\%$. Therefore, the total efficiency of the existing motors are approximately $(86\%)(90\%) = 78\%$.
- Total efficiency (wire-to-water) of the existing pumps & motors = $(73\%)(78\%) = 57\%$ (pump efficiency times total motor efficiency).

Results

- To compare the efficiency of the proposed new pumps & motors with the existing pumps & motors, divide the total efficiency of the proposed new pumps & motors by the total efficiency of the existing pumps & motors: $73\% / 57\% = 1.28$.
- Thus, the increased total efficiency of the proposed new pumps & motors is 28%.

Conclusion

- Efficiency of the water system is to improve due to shorter pipe runs to serve the project area.
- Service area of the existing pumps is to be greatly reduced and thus the existing inefficient pumps will be used less.
- Proposed new energy efficient motors are to have variable frequency drive controls which will reduce energy consumption.
- Total efficiency of the proposed new pumps and motors is 28% more efficient than the existing pumps and motors currently serving the project area. This level of efficiency is greater than the recommended 20% minimum efficiency increase for pumps & motors
- Proposed energy efficient pump motors are 30 hp, while the existing pump motors currently serving the project area are 50 hp. The reduction in horsepower will reduce energy consumption.
- Existing pump motors currently serving the project area have a power consumption of $[(50 \text{ HP})(0.746 \text{ KWhr / HP})] / (78\% \text{ efficiency}) = 47.82 \text{ KWhr}$.
- Proposed energy efficient motors will have a power consumption of $[(30 \text{ HP})(0.746 \text{ KWhr / HP})] / (88\% \text{ efficiency}) = 25.43 \text{ KWhr}$.
- At \$0.0505 per KWhr and 2,300 hours of usage per year, energy reduction with the proposed new pumps and motors versus the existing pumps and motors will save $(47.82 \text{ KWhr} - 25.43 \text{ KWhr})(2,300 \text{ hr})(\$0.0505) = \$2,600.60$ annually.